MISB MOTION IMAGERY STANDARDS BOARD	MISB ST 1403.1
STANDARD	
SARMI Threshold Metadata Sets	**22 June 2017**

1 Scope

This standard defines the Synthetic Aperture Radar Motion Imagery (SARMI) threshold metadata sets which enable the basic capabilities of Situational Awareness, Discovery & Retrieval, and Cross-Domain Dissemination. This metadata is intended to convey collection information related to the SAR image formation and SAR coherent change product processes used to create the SARMI data in addition to mission and classification information.

2 References

[1] MISB ST 0601.11 UAS Datalink Local Set, Feb 2017.

[2] MISB MISP-2017.3 Motion Imagery Standards Profile, Jun 2017.

[3] MISB ST 0807.19 MISB KLV Metadata Registry, Feb 2017.

[4] MISB ST 0107.2 Bit and Byte Order for Metadata in Motion Imagery Files and Streams, Feb 2014.

[5] MISB ST 1402.2 MPEG-2 Transport Stream for Class 1/Class 2 Motion Imagery, Audio and Metadata, Oct 2016.

[6] MISB ST 0102.12 Security Metadata Universal and Local Sets for Digital Motion Imagery, Jun 2017.

[7] MISB ST 1204.1 Motion Imagery Identification System (MIIS) Core Identifier, Oct 2013.

[8] MISB ST 1206.1 SAR Motion Imagery Metadata, Jun 2017.

3 Terms, Acronyms and Definitions

KLV Key-Length-Value
SAR Synthetic Aperture Radar
SARMI SAR Motion Imagery

4 Revision History

Revision	Date	Summary of Changes
1403.1	06/22/2017	• Added Tag 104 as an "Exclusive OR" to Table 1 & added Note 3 on its usage • Added definitions for table column designations • Revised Table 1 & Table 2 columns to reflect more descriptive headings; revised entries accordingly • Revised Bibliography with new format for References • Revised References as: ST 0601.11, MISP-2017.3, ST 0807.19, ST 0107.2, ST 1402.2, ST 0102.12, ST 1204.1, ST 1206.1 • Deprecated requirement ST 1403-02 & incorporated text into Section 6 • Added Section 7

5 Scope

The SARMI threshold metadata set is defined for two cases:

- **Case 1:** Sequential display of SAR imagery
- **Case 2:** Sequential display of SAR coherent change products

The metadata set consists of elements from MISB ST 0601 [1], which enable baseline functionality required for Discovery & Retrieval / Cross-Domain Dissemination of source data and the Situational Awareness Product for ISR mission accomplishment as defined in the MISP [2].

6 SARMI Threshold Metadata Set

The intent of the SARMI threshold metadata set is to profile MISB ST 0601 as a Local Set representation with all elements mandatory per case type unless conditionally dependent.

The KLV Universal Label for the SARMI Threshold Local Set is registered in MISB ST 0807 [3] as:

06.0E.2B.34.02.0B.01.01.0E.01.03.01.01.00.00.00 (CRC 56773)

Requirement(s)	
ST 1403-01	All metadata shall be expressed in accordance with MISB ST 0107 [4].
ST 1403-03	For the sequential display of SAR imagery all SARMI metadata elements as defined in MISB ST 1403 Table 1 shall be populated in accordance with MISB ST 0601 [1] requirements.
ST 1403-04	For the sequential display of SAR coherent change products all SARMI metadata elements as defined in the union of MISB ST 1403

	Table 1 and Table 2 shall be populated in accordance with MISB ST 0601 [1] requirements.
ST 1403-05	Every image frame that comprises a SARMI data stream shall have the complete set of metadata elements as defined by MISB ST 1403 Table 1 or the union of MISB ST 1403 Table 1 and MISB ST 1403 Table 2 as appropriate.
ST 1403-06	All SARMI metadata shall be synchronously multiplexed into the MPEG-2 Transport Stream per MISB ST 1402 [5].

Please refer to MISB ST 0601 for further information on each element. Of interest, Tag 48 is a nested Local Set which contains security information as defined in MISB ST 0102 [6]; Tag 94 is the Motion Imagery Identification System – Core Identifier as defined in MISB ST 1204 [7]; and Tag 95 is a second nested Local Set which contains SARMI unique metadata information as defined in MISB ST 1206 [8].

Note 1: The Motion Imagery Core Identifier (Tag 94) is required as the Motion Imagery data is disseminated from the "system" where the system is the composite of the platform and control station (*i.e.* Ground Control Station).

Note 2: Although requirement ST 1403-06 stipulates the synchronous multiplexing methodology for inserting SARMI metadata into an MPEG-2 Transport Stream, the MISB is still developing a more complete set of timing requirements for the relationship of metadata to a specific image frame. For example, the proximity of the metadata to its corresponding frame within a MPEG-2 Transport Stream has implications on visualization applications in terms of the amount of buffering needed, which impacts overall visualization latency. As the MISB establishes requirements in this area, this standard will be updated accordingly.

Note 3: The use of Tag 75 and Tag 104 is governed by an "exclusive OR" within MISB ST 0601.

6.1 SAR Imagery as SARMI

Table 1 lists the mandatory metadata elements that comprise the SARMI threshold metadata set for the sequential display of SAR imagery as SARMI data. The column designations are as follows:

- **Tag** is the Local Set tag number for the element in the SARMI metadata set.
- **Element Name** is the name of the element.
- **Range & Units** provides the range and unit of specification for the value.
- **Type** indicates the data type of the element.
- **Length** is the number of bytes allowed.

Table 1: Metadata elements for the sequential display of SAR imagery as SARMI data

Tag	Element Name	Range & Units	Type	Length (Bytes)
1	Checksum	None	uint16	2
2	Precision Time Stamp	Microseconds	uint64	8
3	Mission ID	None	ISO 646	Variable
10	Platform Designation	None	ISO 646	Variable
11	Image Source Sensor	None	ISO 646	Variable
12	Image Coordinate System	None	ISO 646	Variable
13	Sensor Latitude	+/- 90 Degrees	int32	4
14	Sensor Longitude	+/- 180 Degrees	int32	4
21	Slant Range	0 to 5000000 Meters	uint32	4
23	Frame Center Latitude	+/- 90 Degrees	int32	4
24	Frame Center Longitude	+/- 180 Degrees	int32	4
82	Corner Latitude Point 1	+/- 90 Degrees	int32	4
83	Corner Longitude Point 1	+/- 180 Degrees	int32	4
84	Corner Latitude Point 2	+/- 90 Degrees	int32	4
85	Corner Longitude Point 2	+/- 180 Degrees	int32	4
86	Corner Latitude Point 3	+/- 90 Degrees	int32	4
87	Corner Longitude Point 3	+/- 180 Degrees	int32	4
88	Corner Latitude Point 4	+/- 90 Degrees	int32	4
89	Corner Longitude Point 4	+/- 180 Degrees	int32	4
48/1	Security Classification	Look Up Table	uint8	1
48/2	Classifying Country & Releasing Instructions Country Coding Method	Look Up Table	uint8	1
48/3	Classifying Country	None	ISO 646	Variable
48/4	Security-SCI/SHI Information	None	ISO 646	Variable
48/5	Caveats	None	ISO 646	Variable
48/6	Releasing Instructions	None	ISO 646	Variable
48/12	Object Country Coding Method	Look Up Table	uint8	1
48/13	Object Country Codes	None	UTF-16	Variable
48/22	Security Metadata Version	0 to 65535 Integer	uint16	2
65	UAS Local Set Version	0 to 255 Integer	uint8	1
75 | 104	Sensor Ellipsoid Height Sensor Ellipsoid Height Extended	-900 to 19000 Meters -900 to 40000 Meters	uint16 IMAPB	2 2
78	Frame Center Height Above Ellipsoid	-900 to 19000 Meters	uint16	2
94	Motion Imagery Core Identifier	None	binary	50
95/1	Grazing Angle	0 to 90 Degrees	IMAPB	2
95/2	Ground Plane Squint Angle	+/- 90 Degrees	IMAPB	2
95/3	Look Direction	Look Up Table	uint8	1
95/4	Image Plane	Look Up Table	uint8	1
95/5	Range Resolution	0 to 1000000 Meters	IMAPB	4
95/6	Cross-Range Resolution	0 to 1000000 Meters	IMAPB	4
95/7	Range Image Plane Pixel Size	0 to 1000000 Meters	IMAPB	4
95/8	Cross-Range Image Plane Pixel Size	0 to 1000000 Meters	IMAPB	4

95/9	Image Rows	0 to 65535 Integer	uint16	2
95/10	Image Columns	0 to 65535 Integer	uint16	2
95/11	Range Direction Angle Relative to True North	0 to 360 Degrees	IMPAB	2
95/12	True North Direction Relative to Top Image Edge	0 to 360 Degrees	IMAPB	2
95/13	Range Layover Angle Relative to True North	0 to 360 Degrees	IMAPB	2
95/28	SARMI Document Version	0 to 255 Integer	uint8	1

6.2 SAR Coherent Change Products as SARMI

The union of elements listed in Table 1 and Table 2 comprise the mandatory metadata elements for the SARMI threshold metadata set for the sequential display of SAR coherent change products as SARMI data. Column designations defined as above.

Table 2: Additional metadata elements for the sequential display of SAR coherent change products as SARMI data

Tag	Element Name	Range & Units	Type	Length (Bytes)
95/23	Reference Frame Precision Time Stamp	Microseconds	uint64	8
95/24	Reference Frame Grazing Angle	0 to 90 Degrees	IMAPB	2
95/25	Reference Frame Ground Plane Squint Angle	+/- 90 Degrees	IMAPB	2
95/26	Reference Frame Range Direction Angle Relative to True North	0 to 360 Degrees	IMAPB	2
95/27	Reference Frame Layover Angle Relative to True North	0 to 360 Degrees	IMPAB	2

7 Deprecated Requirements

Requirement	
ST 1403-02	The SARMI threshold set shall use MISB ST 0601 Local Set 16-byte Universal Key, 06.0E.2B.34.02.0B.01.01.0E.01.03.01.01.00.00.00 (CRC 56773) for its implementation. [Defined in MISB ST 0807 so requirement is not necessary]